

## Durham Research Online

---

### Deposited in DRO:

09 June 2015

### Version of attached file:

Published Version

### Peer-review status of attached file:

Peer-reviewed

### Citation for published item:

Smailes, D. and Moseley, P. and Wilkinson, S. (2015) 'A commentary on : Affective coding : the emotional dimension of agency.', *Frontiers in human neuroscience.*, 9 . p. 142.

### Further information on publisher's website:

<http://dx.doi.org/10.3389/fnhum.2015.00142>

### Publisher's copyright statement:

© 2015 Smailes, Moseley and Wilkinson. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) or licensor are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.

### Additional information:

## Use policy

---

The full-text may be used and/or reproduced, and given to third parties in any format or medium, without prior permission or charge, for personal research or study, educational, or not-for-profit purposes provided that:

- a full bibliographic reference is made to the original source
- a [link](#) is made to the metadata record in DRO
- the full-text is not changed in any way

The full-text must not be sold in any format or medium without the formal permission of the copyright holders.

Please consult the [full DRO policy](#) for further details.

# A commentary on: Affective coding: the emotional dimension of agency

David Smailes<sup>1\*</sup>, Peter Moseley<sup>1†</sup> and Sam Wilkinson<sup>2</sup>

<sup>1</sup> Department of Psychology, Durham University, Durham, UK, <sup>2</sup> Department of Philosophy, Durham University, Durham, UK

**Keywords:** affect, emotion, agency, hallucinations, voice hearing, psychosis

## A commentary on

### Affective coding: the emotional dimension of agency

by Gentsch, A., and Synofzik, M. (2014). *Front. Hum. Neurosci.* 8:608. doi: 10.3389/fnhum.2014.00608

We welcome Gentsch and Synofzik's (2014) review of the role of affect in modulating a person's sense of agency (SoA). The review is timely and synthesizes a great deal of evidence. However, we feel that their claims concerning the role of affect in modulating a person's SoA could be usefully extended to the study of auditory hallucinations (AH), one unusual experience not discussed in their review. In this commentary, we describe recent findings that suggest that one way in which negative affect plays a role in the development of AH is by reducing the SoA associated with self-generated cognitions and suggest that the insula may play an important role in mediating the effect of affect on SoA.

Cognitive models of AH (e.g., Bentall, 1990; Waters et al., 2012) suggest that they occur when a cognition is misattributed to an external, non-self-source. Consistent with this claim, people who experience AH tend to show a bias toward accepting the presence of a verbal stimulus on tasks designed to measure reality discrimination (i.e., they tend to confuse internal, self-generated events for external, non-self-generated events, but not vice versa; Brookwell et al., 2013). This is often demonstrated using an auditory signal detection task (SDT), in which participants must try to detect speech in an ambiguous auditory stimulus (typically white noise). On trials where the speech is absent, participants have the opportunity to make a false alarm; that is, to report that speech was present in the white noise, when it was not. Presumably, when participants make a false alarm, they have mistaken their internal representation of the speech for the externally presented, "real" speech.

Two recent studies have demonstrated a causal relation between increases in negative affect and weaker reality discrimination. Smailes et al. (2014) reported that participants who performed an auditory SDT after completing a negative mood induction (recalling an unpleasant autobiographical memory) made more false alarms, but not more hits, than did participants who performed the task after completing a neutral mood induction. Similarly, Hoskin et al. (2014), despite employing a different mood induction and a modified SDT, reported that participants were more likely to make false alarms during a condition in which they were exposed to a stressor than during a control condition. Thus, both studies showed that when participants experienced negative affect, they were more likely to misattribute internal, self-generated cognitions to an external source. These findings are consistent with data from studies that have shown that negative affect tends to precede the onset of AH in the daily lives of psychosis patients (Nayani and David, 1996; Delespaul et al., 2002), and suggest that negative affect is associated with the onset of AH, at least in part, because it modulates SoA for cognition.

## OPEN ACCESS

### Edited by:

Lorenzo Pia,  
University of Turin, Italy

### Reviewed by:

Andreas Kalckert,  
Karolinska Institutet, Sweden

### \*Correspondence:

David Smailes,  
david.smailes@durham.ac.uk

### † Present Address:

Peter Moseley,  
School of Psychology, University of  
Central Lancashire, Preston, UK

**Received:** 17 January 2015

**Paper pending published:**

26 January 2015

**Accepted:** 01 March 2015

**Published:** 17 March 2015

### Citation:

Smailes D, Moseley P and Wilkinson S  
(2015) A commentary on: Affective  
coding: the emotional dimension of  
agency. *Front. Hum. Neurosci.* 9:142.  
doi: 10.3389/fnhum.2015.00142

Gentsch and Synofzik propose that three stages of agency processing—prospective, immediate, and retrospective—exist. First person accounts (e.g., Romme et al., 2009; Scholtus and Blanke, 2012) suggest that people who experience AH do not go through a deliberative process to determine whether an unusual auditory percept was self-generated, or was a result of an external, non-self agent. Instead, an AH is experienced “in the moment” as something that was not self-generated. Thus, in terms of Gentsch and Synofzik’s proposed stages, it seems likely that the effect of negative emotions on a person’s reality discrimination abilities would correspond to either prospective or immediate affective coding, rather than retrospective affective coding. That is, negative affect may reduce a person’s SoA over cognition by interfering with action planning or with the generation of an accurate sensory outcome representation of a cognition. The most prominent cognitive models of AH suggest that a forward model system acts to predict the sensory outcomes of motor commands, and that dysfunction at one of a number of comparators can lead to a lack of agency over self-generated actions (Jones and Fernyhough, 2007). Interference with either action planning or accurate prediction could therefore lead to external misattributions of self-generated processes. A potential avenue for research would be to investigate whether negative affect can modulate, for example, the sensory attenuation which is associated with successful prediction via forward modeling.

Gentsch and Synofzik’s review only briefly discusses the brain regions that may be involved in mediating the effects of

negative affect on SoA. At two points, however, they cite evidence suggesting that damage to/atypical activity in the insula can lead to disorders of SoA. We concur that the insula is a good candidate for mediating the effects of negative affect on SoA. This is because, in addition to the evidence cited by Gentsch and Synofzik, a number of studies have shown (a) that different agency experiences are associated with changes in insula activity (e.g., Farrer and Frith, 2002; Farrer et al., 2003), (b) that insula activity is atypical in people who report AH (Wylie and Tregellas, 2010) and (c) that increases in negative affect are associated with changes in insula activity (Phan et al., 2002; Harrison et al., 2008). Research that examines whether negative affect brings about reductions in a person’s SoA over their cognitions through modulation of activity in the insula is required.

Demonstrating that affective problems may play an important role in the development of AH is important for a number of reasons. First, affect-induced changes in the SoA a person has over their cognitions can help to explain why AH are typically not experienced constantly (this issue is sometimes raised as a problem for cognitive models of AH; Gallagher, 2004). Seconds, and perhaps more importantly, it opens up the possibility of novel therapeutic interventions. While the primary focus of such interventions may be on ameliorating the affective problems reported by people who hear voices, they may indirectly reduce the frequency of AH by preventing negative affect-induced modulations of a person’s SoA over their cognitions.

## References

- Bentall, R. P. (1990). The illusion of reality: a review and integration of psychological research on hallucinations. *Psychol. Bull.* 107, 82–95. doi: 10.1037/0033-2909.107.1.82
- Brookwell, M. L., Bentall, R. P., and Varese, F. (2013). Externalizing biases and hallucinations in source-monitoring, self-monitoring and signal detection studies: a meta-analytic review. *Psychol. Med.* 43, 2465–2475. doi: 10.1017/S0033291712002760
- Delespaul, P., de Vries, M., and van Os, J. (2002). Determinants of occurrence and recovery from hallucinations in daily life. *Soc. Psychiatry Psychiatr. Epidemiol.* 37, 97–104. doi: 10.1007/s001270200000
- Farrer, C., Franck, N., Georgieff, N., Frith, C. D., Decety, J., and Jeannerod, M. (2003). Modulating the experiences of agency: a positron emission tomography study. *Neuroimage* 18, 324–333. doi: 10.1016/S1053-8119(02)00041-1
- Farrer, C., and Frith, C. D. (2002). Experiencing oneself vs another person as being the cause of an action: the neural correlates of the experience of agency. *Neuroimage* 15, 596–603. doi: 10.1006/nimg.2001.1009
- Gallagher, S. (2004). Neurocognitive models of schizophrenia: a neurophenomenological critique. *Psychopathology* 37, 8–19. doi: 10.1159/000077014
- Gentsch, A., and Synofzik, M. (2014). Affective coding: the emotional dimension of agency. *Front. Hum. Neurosci.* 8:608. doi: 10.3389/fnhum.2014.00608
- Harrison, B. J., Pujol, J., Ortiz, H., Fornito, A., Pantelis, C., and Yücel, M. (2008). Modulation of brain resting-state networks by sad mood induction. *PLOS ONE* 3:e1794. doi: 10.1371/journal.pone.0001794
- Hoskin, R., Hunter, M. D., and Woodruff, P. W. R. (2014). The effect of psychological stress and expectation on auditory perception: a signal detection analysis. *Br. J. Psychol.* 105, 524–546. doi: 10.1111/bjop.12048
- Jones, S. R., and Fernyhough, C. (2007). Neural correlates of inner speech and auditory verbal hallucinations: a critical review and theoretical integration. *Clin. Psychol. Rev.* 27, 140–154. doi: 10.1016/j.cpr.2006.10.001
- Nayani, T. H., and David, A. S. (1996). The auditory hallucination: a phenomenological survey. *Psychol. Med.* 26, 177–189. doi: 10.1017/S003329170003381X
- Phan, K. L., Wager, T., Taylor, S. F., and Liberzon, I. (2002). Functional neuroanatomy of emotion: a meta-analysis of emotion activation studies in PET and fMRI. *Neuroimage* 16, 331–348. doi: 10.1006/nimg.2002.1087
- Romme, M., Escher, S., Dillon, J., Corstens, D., and Morris, M. (2009). *Living with Voices: Fifty Stories of Recovery*. Ross-on-Wye: PCCS.
- Scholtus, S., and Blanke, C. (2012). “Auditory verbal hallucinations, first-person accounts,” in *Hallucinations: Theory and Practice*, eds J. D. Blom and I. E. C. Sommer (New York, NY: Springer), 105–108.
- Smailes, D., Meins, E., and Fernyhough, C. (2014). The impact of negative affect on reality discrimination. *J. Behav. Ther. Exp. Psy.* 45, 389–395. doi: 10.1016/j.jbtep.2014.04.001
- Waters, F., Allen, P., Aleman, A., Fernyhough, C., Woodward, T. S., Badcock, J. C., et al. (2012). Auditory hallucinations in schizophrenia and nonschizophrenia populations: a review and integrated model of cognitive mechanisms. *Schizophr. Bull.* 38, 683–692. doi: 10.1093/schbul/sbs045
- Wylie, K. P., and Tregellas, J. R. (2010). The role of the insula in schizophrenia. *Schizophr. Res.* 123, 93–104. doi: 10.1016/j.schres.2010.08.027

**Conflict of Interest Statement:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright © 2015 Smailes, Moseley and Wilkinson. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) or licensor are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.